



Preliminary Analysis of Area-Level Drinking Water Arsenic and Bladder Cancer Incidence Rates in New Mexico, 1988-2002

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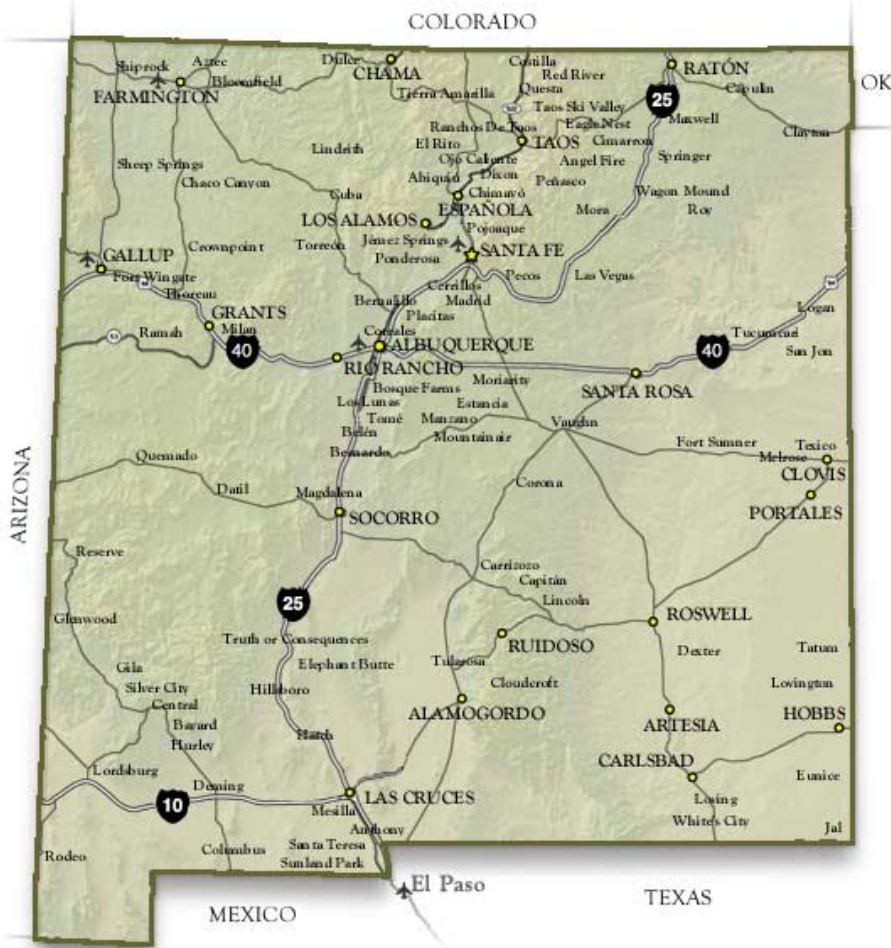
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OVERVIEW

New Mexico Drinking Water Arsenic and Cancer Incidence Linkage Demonstration Project

<i>Study Design:</i>	Ecologic, aggregate data linkage
<i>Geographic Level:</i>	Census tract (2000 US Census, N=456)
<i>Time Frame:</i>	1988-2002
<i>Health Outcomes:</i>	Bladder, lung, kidney, liver (primary) Other cancers (secondary)
<i>Arsenic Exposure:</i>	Municipal water systems (primary) Private wells (secondary)
<i>Data Management:</i>	Geographic information system (GIS)
<i>Data Analysis:</i>	Exposure-stratified incidence rates and rate ratios, Poisson regression

New Mexico



33 Counties

456 Census Tracts (2000)

Main Cities/Towns

Albuquerque	448607
Las Cruces	74267
Santa Fe	62203
Rio Rancho	51765
Roswell	45293
South Valley	39060
Farmington	37844
Alamogordo	35582
Clovis	32667
Hobbs	28657
Carlsbad	25625
Gallup	20209

Racial/Ethnic Distribution of New Mexico Population 2000 US Census

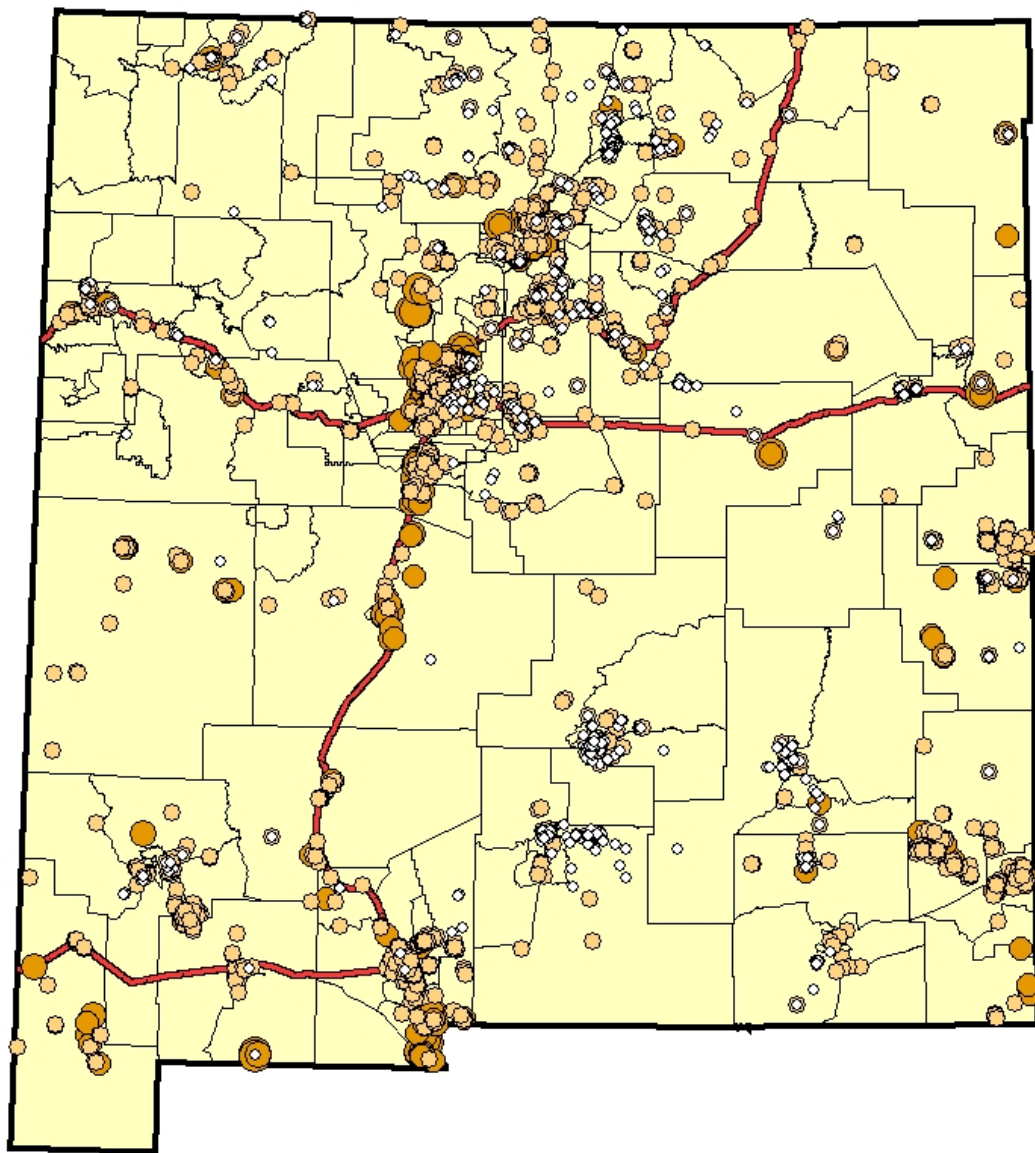
	RACIAL/ETHNIC GROUP	Count	(%)
	Total	1819046	100.0
	Not Hispanic or Latino	1053660	57.9
⇒	White alone	813495	44.7
	Black or African American alone	30654	1.7
⇒	American Indian or Alaska Native alone	161460	8.9
	Asian, Native Hawaiian, Other Pacific Islander alone	19249	1.1
	Some other race alone	3009	0.2
	Two or more races	25793	1.4
⇒	Hispanic or Latino	765386	42.1
	White alone	400758	22.0
	Black or African American alone	3689	0.2
	American Indian or Alaska Native alone	12023	0.7
	Asian, Native Hawaiian, Other Pacific Islander alone	1509	0.1
	Some other race alone	306873	16.9
	Two or more races	40534	2.2

Data Sources for Drinking Water Arsenic Exposure Assessment

Arsenic in Municipal
Water Supplies
NMED Drinking Water
Bureau

Arsenic (ppb)

- <1.0
- 1.0 – 10.0
- 10.1 - 30.0
- 30.1 - 50.0
- >50.0



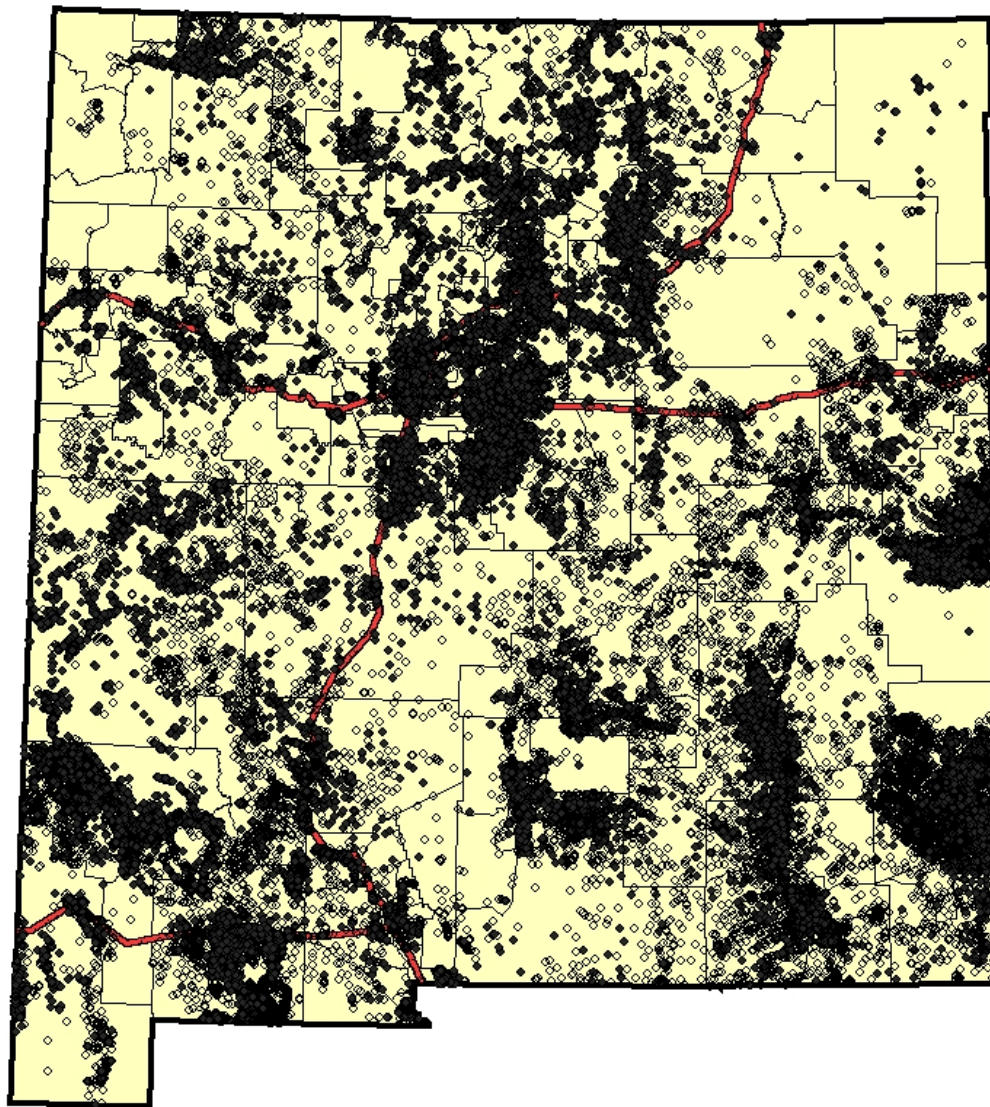
Qualitative Data Source for Drinking Water Arsenic Exposure Assessment



Private Wells in New
Mexico
Office of State
Engineer

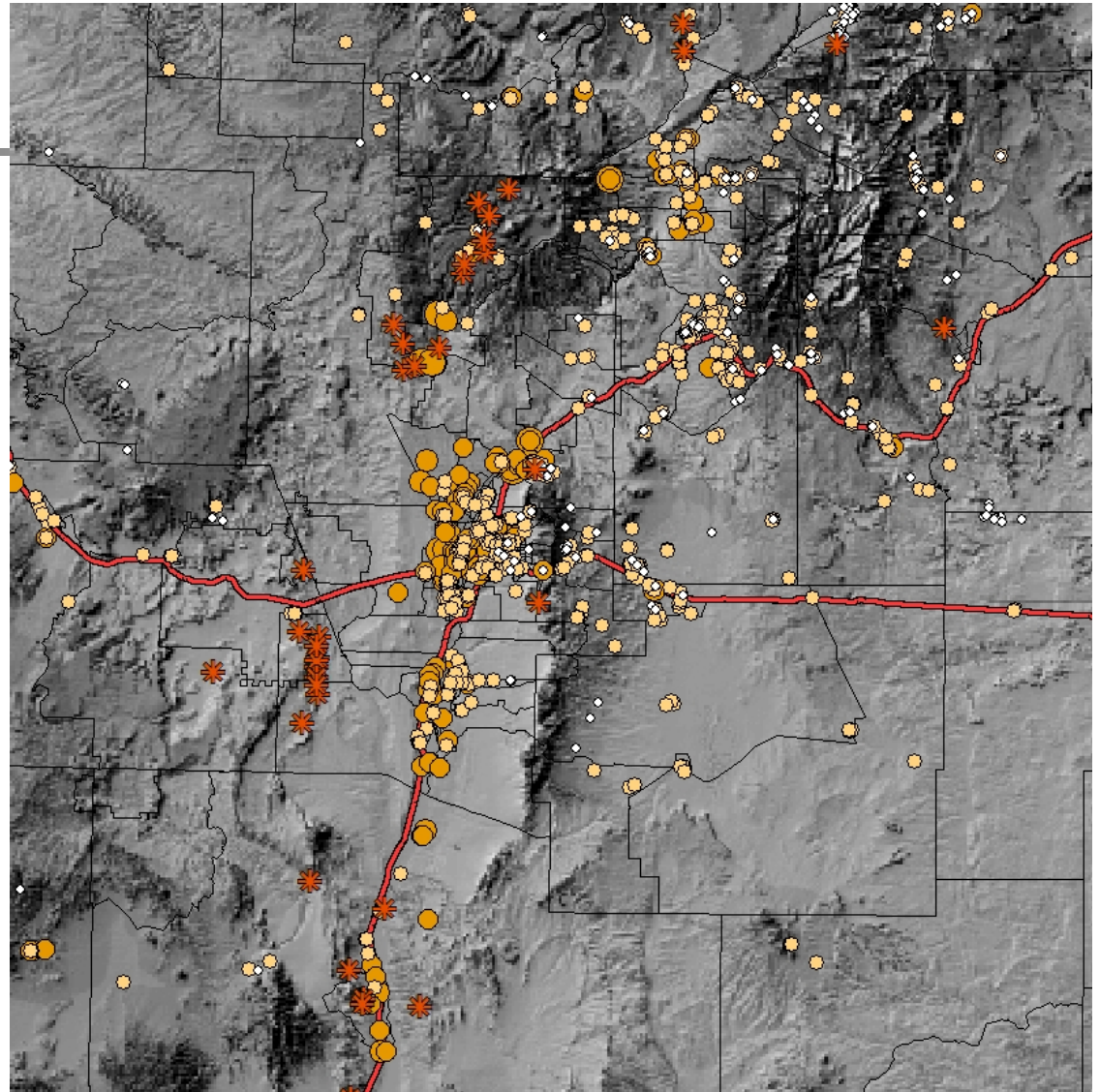
Well Use

- Domestic
- Other



Geologic Factors Affecting Exposure to Arsenic

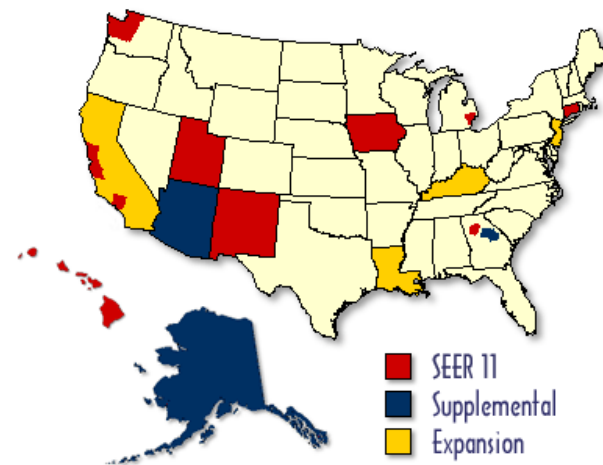
Volcanic
Geology & Hot
Springs



Data Sources for Cancer Case Numerator and Population Denominator Data

- **New Mexico Tumor Registry**

- NCI/SEER registry since 1973
- Statewide, population-based
- 1988-2002: N~ 94,000 case records
 - All invasive cancers
 - Non-invasive (*in-situ*) breast cancers
 - Benign brain tumors (1996-2002)



SEER= Surveillance,
Epidemiology, & End Results

- **US Census Bureau**

- Age, gender, racial/ethnic specific counts
 - 1990 Census (385 census tracts)
 - 2000 Census (445 census tracts)

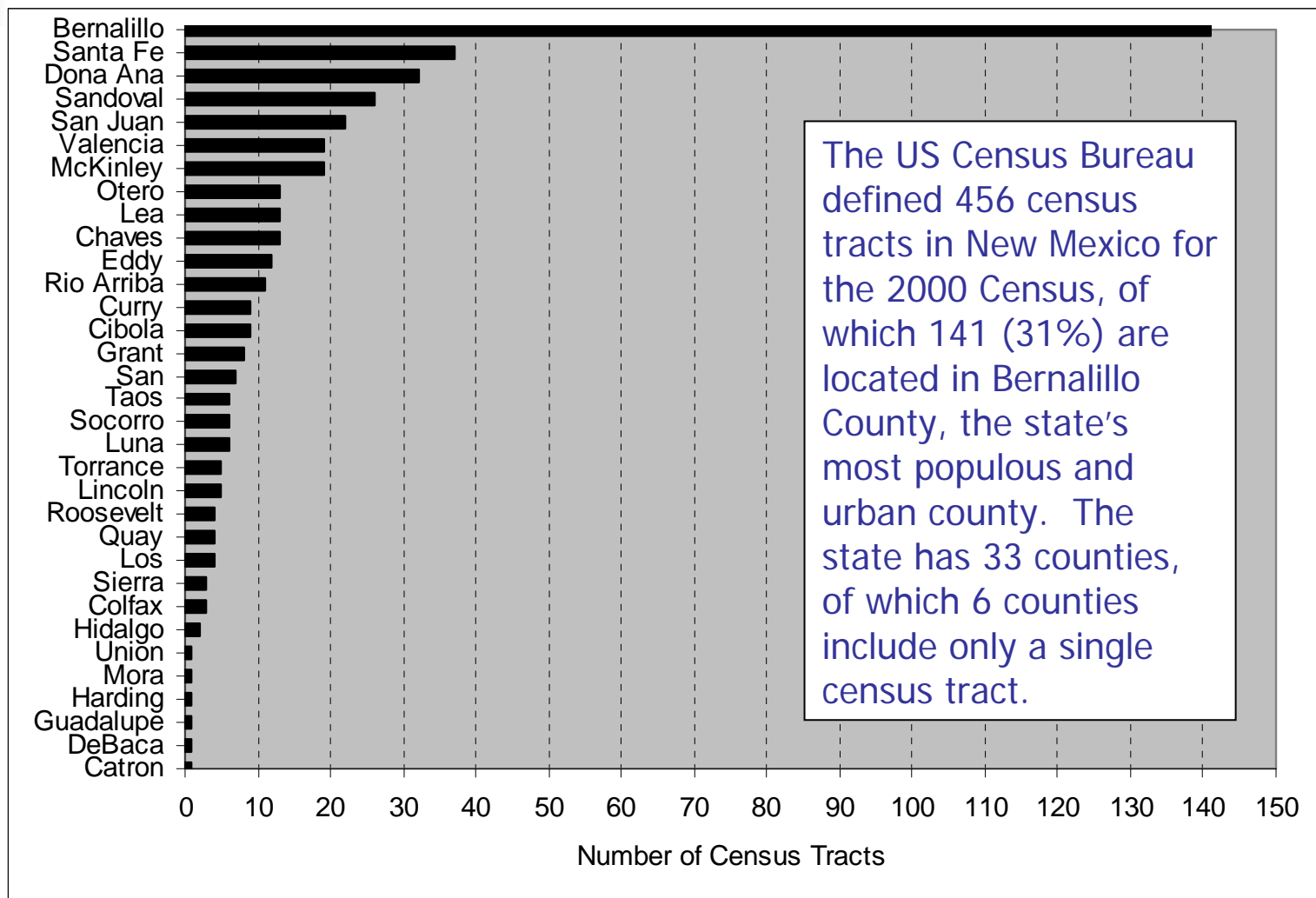
Development of 1988-2002 Age, Sex, and Racial/Ethnic Specific Census Tract Population Denominator Data

University of New Mexico Bureau of Business & Economic Research (UNM/BBER)

- 1990 to 2000 Census Tract Correspondence
 - Reconcile 1990 population data into 2000 tract boundaries
- 2000 to 1990 Racial/Ethnic Bridging
 - Reconcile 2000 multiple races data into 1990 racial/ethnic groups
 - Non-Hispanic White
 - Hispanic
 - American Indian
 - Black
 - Asian/Pacific Islander
- Intercensal/post-censal estimates: linear interpolation

Multiple Races → → →

Number of Census Tracts (2000 Census) Per County in New Mexico

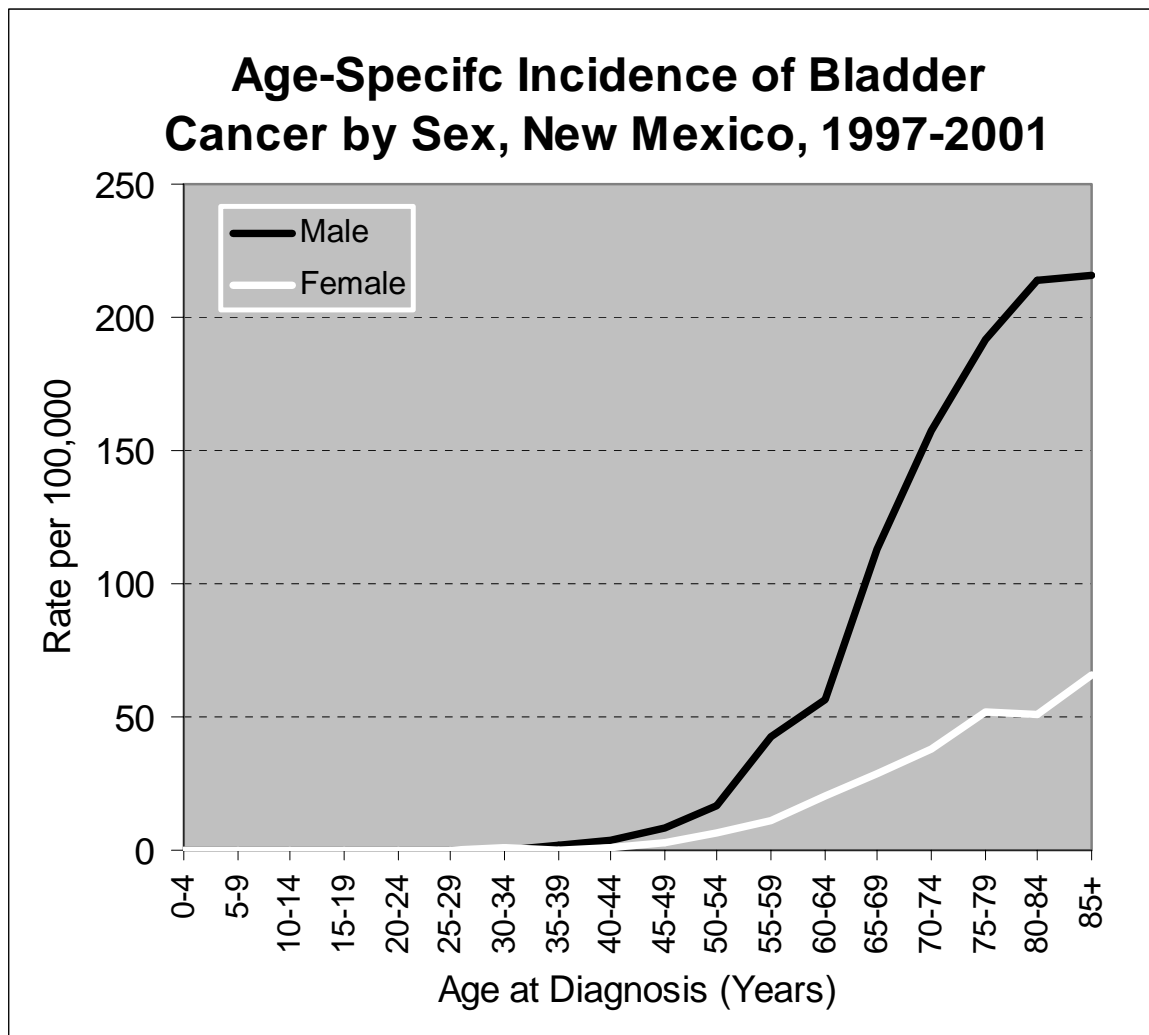




Preliminary Linkage and Analysis of Drinking Water Arsenic and Bladder Cancer Incidence in New Mexico, 1988-2002

- Descriptive epidemiology of bladder cancer in New Mexico
 - Person, place, time
- Methods
 - Drinking water arsenic exposure assessment
 - Characteristics of 1988-2002 bladder cancer cases
- Preliminary Results
 - Linkage of bladder cancer incidence data with preliminary census tract drinking water arsenic

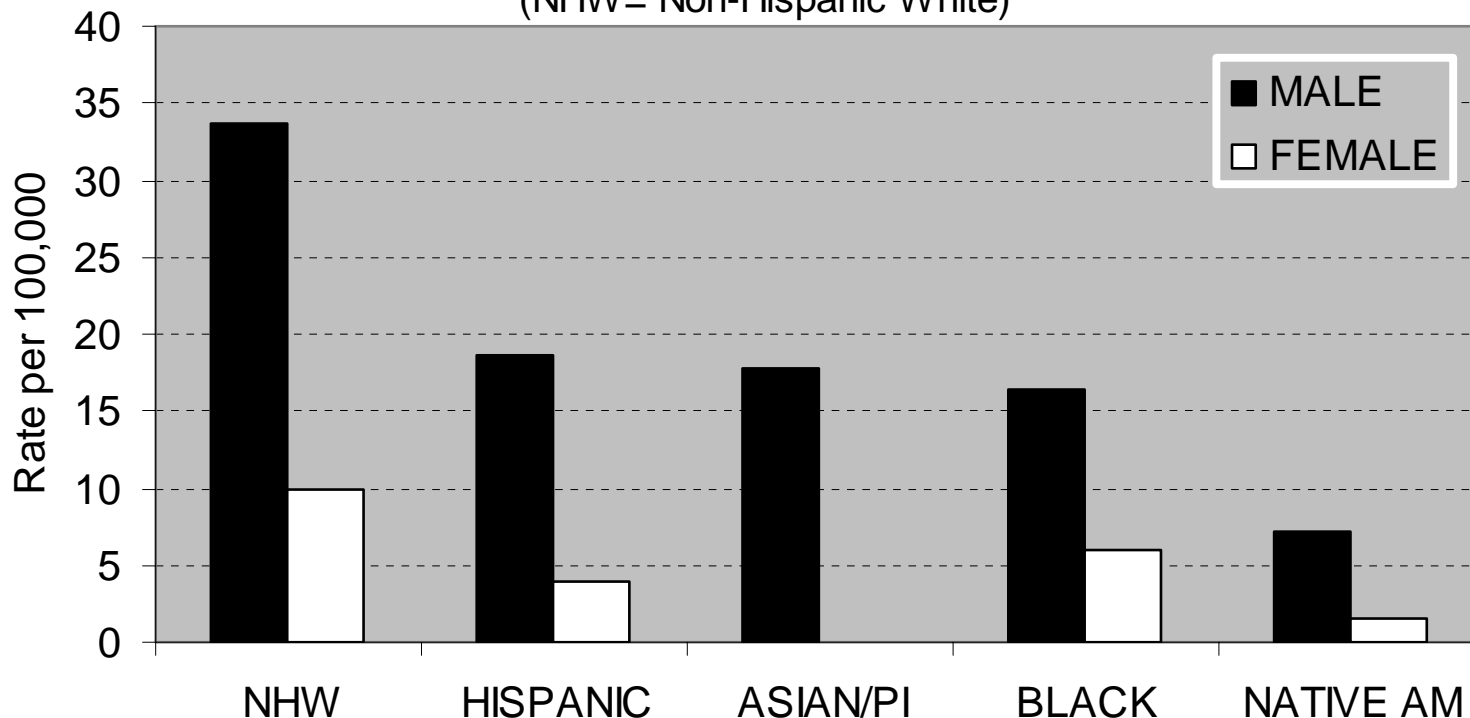
Age-Specific Pattern of Bladder Cancer Incidence in New Mexico, 1997-2001



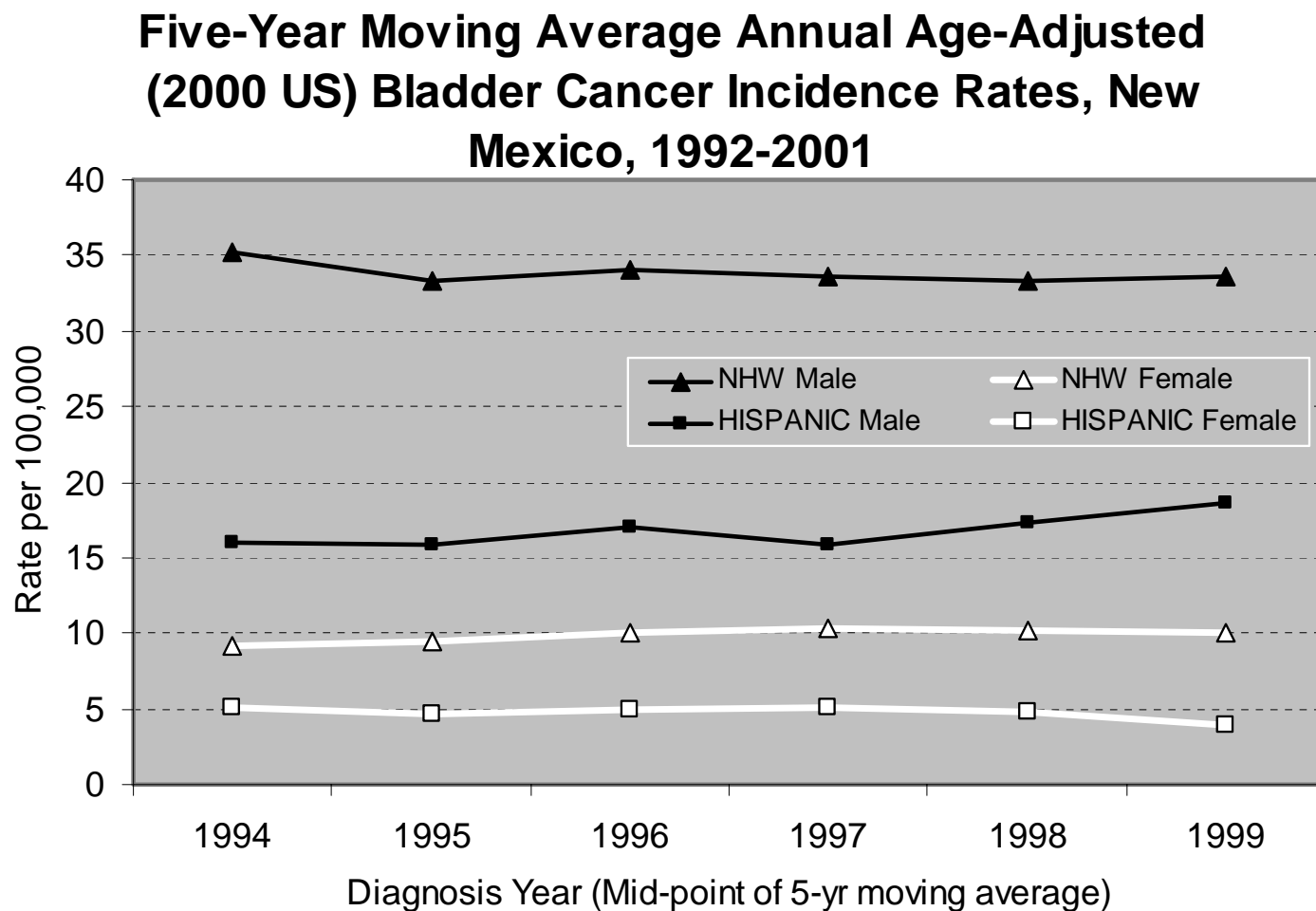
Gender and Racial/Ethnic Pattern of Bladder Cancer Incidence in New Mexico, 1997-2001

Average Annual Age-Adjusted (2000 US) Bladder Cancer Incidence Rates by Sex and Race/Ethnicity, New Mexico, 1997-2001

(NHW= Non-Hispanic White)



Temporal Pattern of Bladder Cancer Incidence in New Mexico Hispanics and Non-Hispanic Whites, 1992-2001

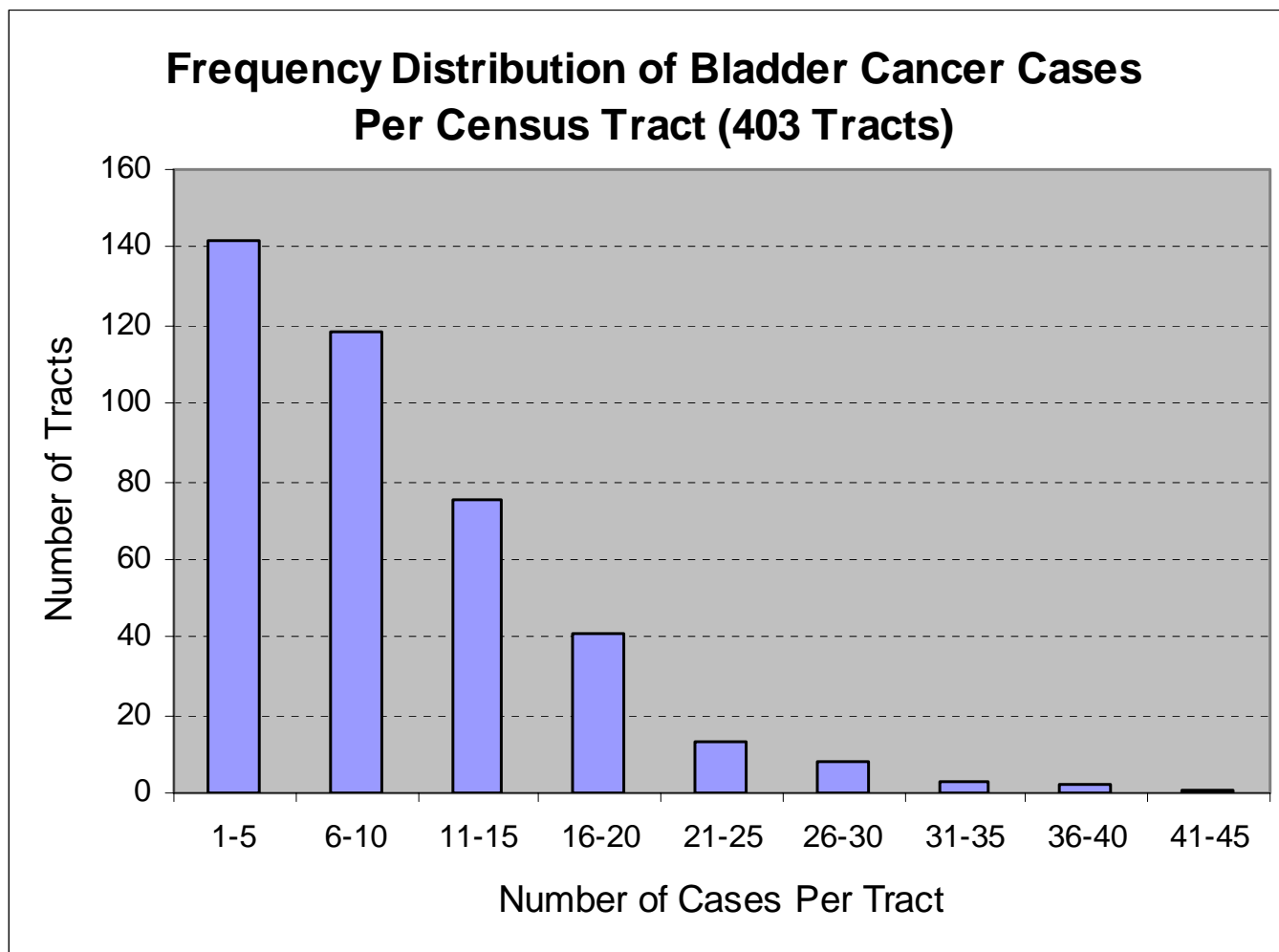


Distribution of 1988-2002 New Mexico Bladder Cancer Cases by Sex and Race/Ethnicity						
Race/Ethnicity	Male		Female		Both	
	No.	%	No.	%	No.	%
Non-Hispanic White	2278	60.8	761	20.3	3039	81.1
Hispanic	499	13.3	166	4.4	665	17.8
Black	27	0.7	8	0.2	35	0.9
Asian/Pacific Islander	7	0.2	0	0.0	7	0.2
All Race/Ethnicities	2811	75.0	935	25.0	3746	100.0
** Excludes 43 Native American cases						

Geocoding Results for 1988-2002 Bladder Cancer Cases

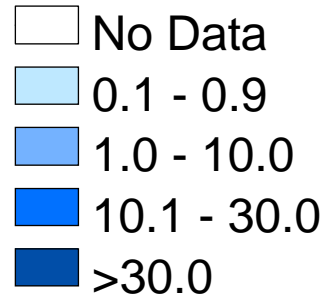
Distribution of 1988-2002 New Mexico Hispanic and Non-Hispanic White Bladder Cancer Cases by Geocoding Results						
Race/Ethnicity	Address Match		Zipcode Centroid		Total	
	No.	%	No.	%	No.	%
Non-Hispanic White						
Male	1839	80.7	439	19.3	2278	100.0
Female	632	83.0	129	17.0	761	100.0
Hispanic						
Male	358	71.7	141	28.3	499	100.0
Female	124	74.7	42	25.3	166	100.0

Distribution of 1988-2002 Bladder Cancer Cases by Census Tract at Diagnosis

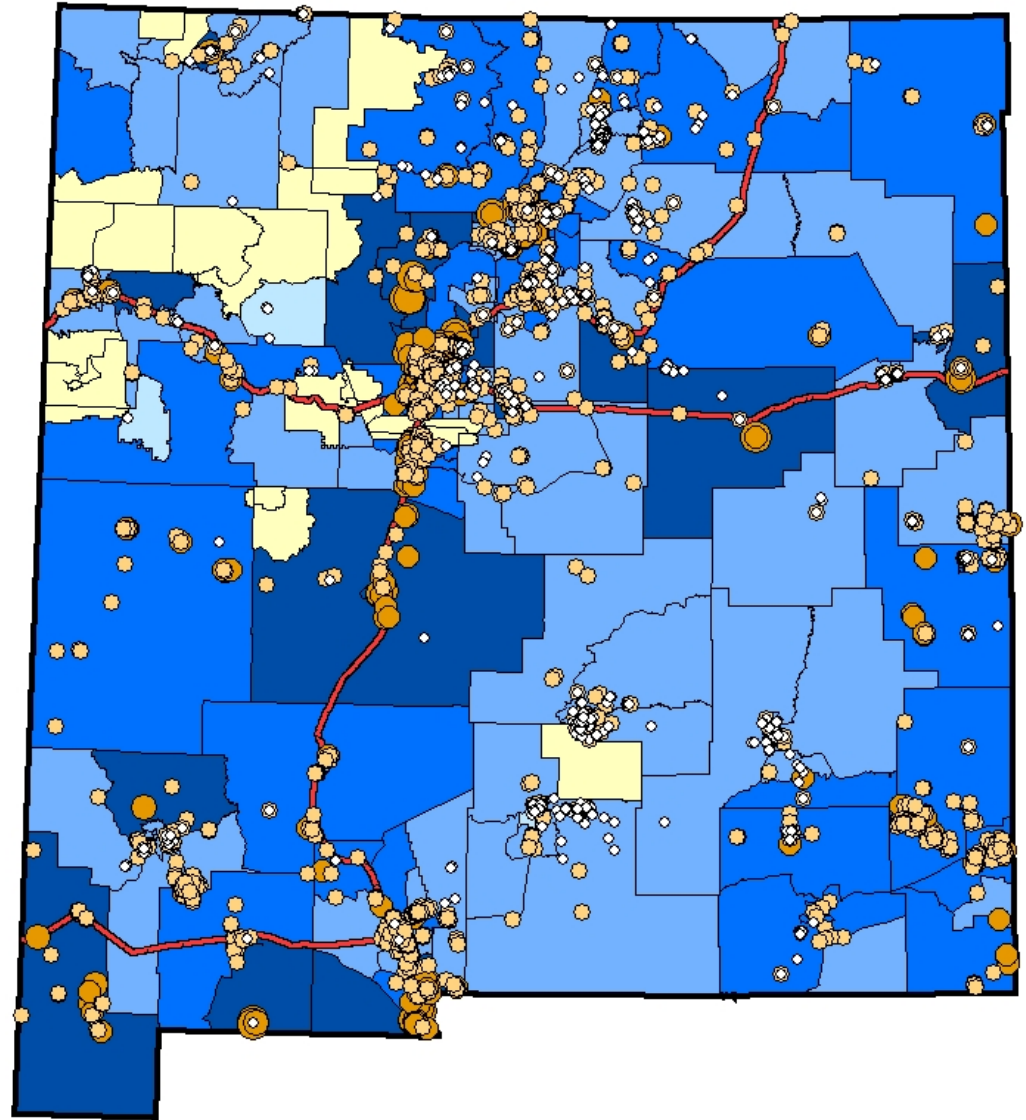
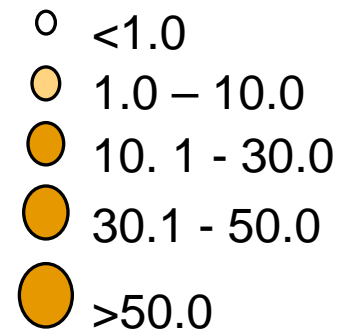


Geographic Distribution of New Mexico Census Tracts According to Drinking Water Arsenic

Tract Arsenic (ppb)

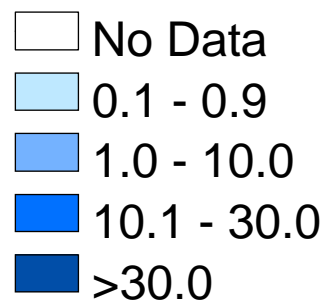


Arsenic (ppb)

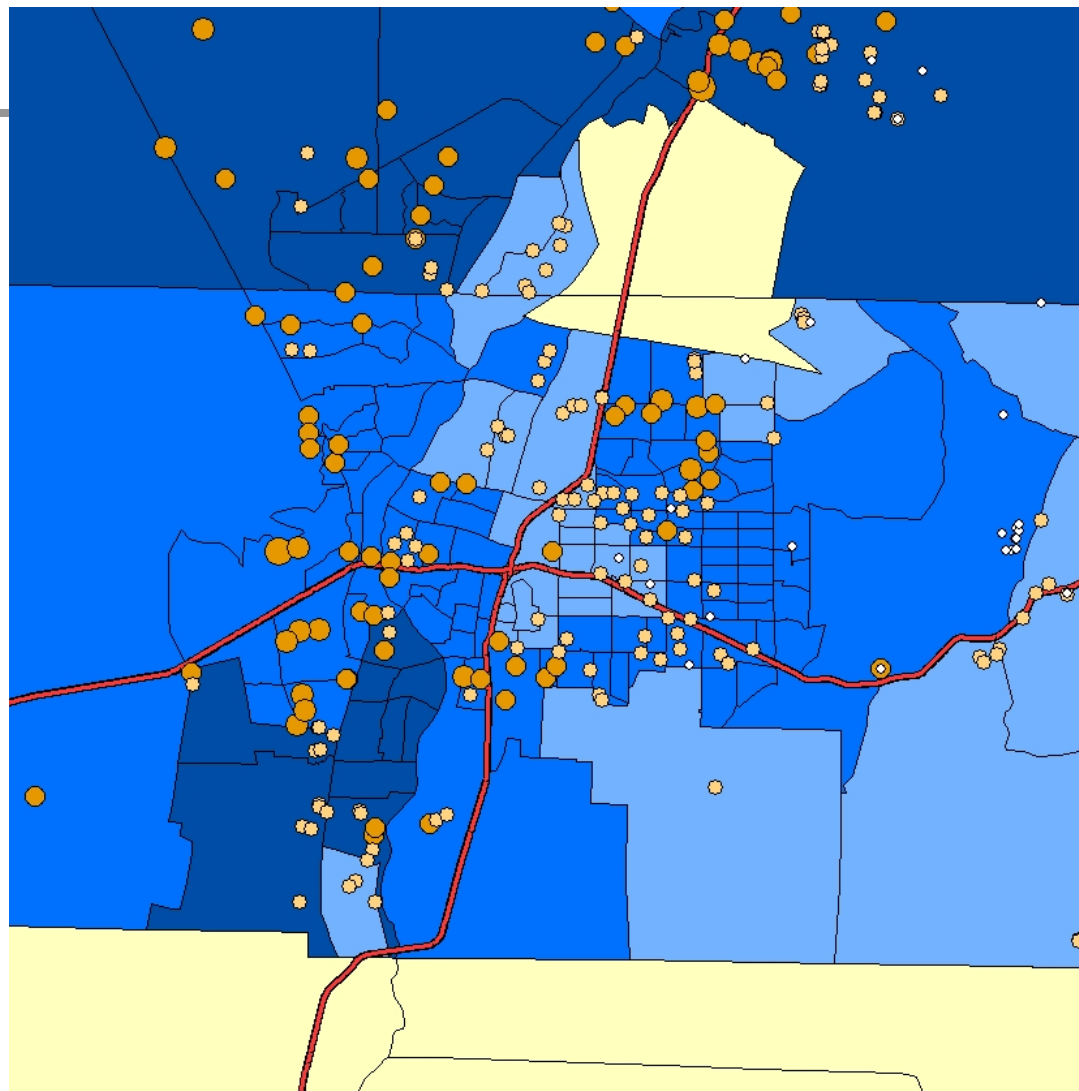
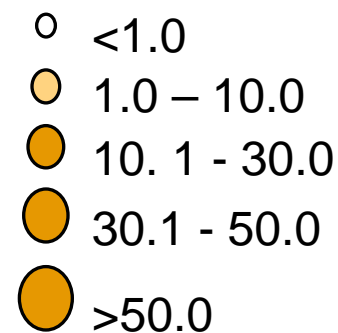


Geographic Distribution of Albuquerque Census Tracts According to Drinking Water Arsenic

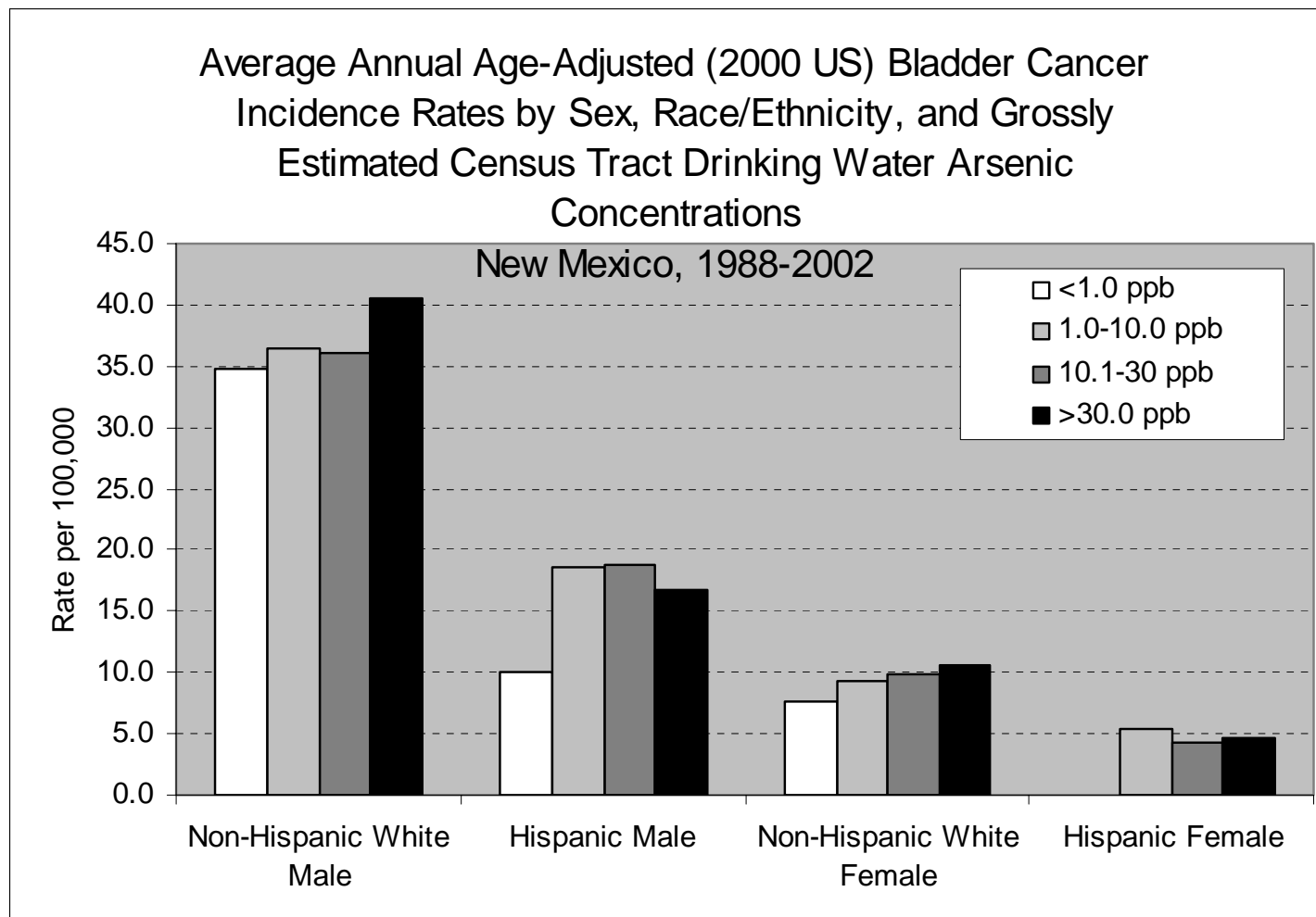
Tract Arsenic (ppb)



Arsenic (ppb)



Preliminary Bladder Cancer Incidence Rates by Sex, Race/Ethnicity and Drinking Water Arsenic Levels New Mexico, 1988-2002





Preliminary Findings

- Geocoding cancer data requires significant effort to resolve non-address level records, but provides the level of resolution needed for geospatial data linkage
- Estimating exposure concentrations of arsenic in drinking water requires finer geographic resolution than the census tract in many New Mexico tracts
- Once these tools are developed they can easily be adapted to other drinking water and cancer studies